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To: Distribution
From: S. Ohnuma

Harmonic Components of the Doubler Dipole Field
in DC and AC Modes

Harmonic components measured in AC mode are stored in the file ACH.DAT[103,122]. As of today, magnets included in the file are

#115, 117, 118, 119, 120, 123, 124, 130

Of these, only #118 has a complete set of data (body and two ends). All others are for the body field only. All magnets with the exception of #130 are Stay-brite type. #130 uses Stay-brite for the outer coils but uses Ebonal for the inner coils. As far as I know, there are three magnets which use Ebonal for all coils, RCA-64, RGA-109 and RGA-110. The last two are in the stage of "Repair Heaters". I have no idea whether AC measurements were made on #64; I could not see anything in the original data book kept at the Industrial #1.

In order to see if there is any effect coming from the Ebonal conductor, I have processed data on #118 (all Stay-brite) and on #130 (inner Ebonal, outer Stay-brite). Results are given in the attached sheets. It seems difficult to draw any conclusions from this and we will have to make more measurements.

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PBA118 (all Stay-brite conductors); body and two ends combined.

1. 3,000A (30 kG) (dI/dt = 180 - 190 A/sec)

# of poles	ΔB_Y at 1" (normal)		B_x at 1" (skew)		
	DC	AC	DC	AC	
4	4.44 G	4.00 G	8.55 G	9.29 G	
6	-35.4	-35.2	-.184	.711	(?)
8	3.49	3.91	1.75	.844	
10	8.63	7.79	.287	.399	
14	10.8	11.0	-.393	-.264	

local gradients on the median plane: $\partial B_Y / \partial x$ and $\partial B_x / \partial x$

	normal		skew		
	DC	AC	DC	AC	
x=-1"	60.0 G/cm	57.9 G/cm	23.9 G/cm	18.8 G/cm	
-.5"	15.1	15.1	4.19	3.78	
+.5"	-9.49	-9.57	4.01	4.49	
1"	-55.5	-44.6	13.6	21.4	(?)

These local gradients are a measure of contributions from higher harmonic components.

2. 500A (5 kG)

	normal		skew		
	DC	AC	DC	AC	
4	.829 G	.731 G	1.55 G	.054 G	(?)
6	-8.78	-8.23	-.049	-.100	
8	.703	.701	.525	-.817	(?)
10	1.22	-.258	-.028	-.071	
14	1.28	.940	-.441	-.382	

Local gradients:

-1"	11.0 G/cm	11.9 G/cm	10.3 G/cm	4.30 G/cm	(?)
-.5"	3.78	3.81	.953	-.075	(?)
.5"	-2.73	-2.89	.808	-.241	(?)
1"	-10.8	-12.5	3.75	1.84	(?)

PCA130 (inner Ebonal, outer Stay-brite); body field only.

1. 3,000A (30 kG)

	normal			skew	
	DC	AC		DC	AC
4	-.467 G	-2.48 G	(?)	15.5 G	14.2 G
6	6.07	3.07	(?)	-1.12	-.482
8	4.10	4.31		-5.72	-6.45
10	18.8	19.1		.615	.522
14	12.7	13.3		1.76	1.82

Local gradients on the median plane:

	DC	AC		DC	AC
-1"	-2.79 G/cm	-.070 G/cm	(?)	24.7 G/cm	23.8 G/cm
-.5"	-4.91	-4.54		4.66	3.73
.5"	7.42	5.63		4.23	3.90
1"	-13.5	-15.9		7.19	18.1 (?)

2. 500A (5 kG)

	normal			skew	
	DC	AC		DC	AC
4	-.263	-.641	(?)	2.44	1.71
6	-2.10	-4.51	(?)	-.281	-.148
8	.662	.651		-.893	-1.44
10	3.25	3.58		-.041	-.171
14	1.54	1.94		.297	.161

Local gradients:

	DC	AC		DC	AC
-1"	1.41	2.21		5.05	5.28
-.5"	.330	1.06	(?)	.808	.322 (?)
.5"	-.105	-1.09	(?)	.601	.130 (?)
1"	-6.82	-9.93		-.162	-5.62 (?)